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Social Acceptance and Social Innovation in Wind Power Technology

Yasushi MARUYAMA^{*}, Makoto NISHIKIDO[†], Shota FURUYA[‡], Tetsunari IIDA[§]

Key words: Social acceptance, Social innovation, Wind energy, Community Wind Power, Ownership Models

1. Introduction

The purpose of this paper is to describe various social changes, which are brought about by community wind power in Japan. As the number of wind power station increase, there are two inconsistent reactions. One is the rise of protest movement lead by naturalists, based on destruction of nature including avian collision problem and/or landscape. The other is the rise of community wind power, in which the amount of facilities and participants are rapidly growing.

We focus on this contradiction from a framework of social justice, such as distribution justice between global and local societies, which composes a background of dualistic conflict between pros and cons of wind power. In addition, we will make it clear that a “Social Innovation” accompanied with community wind power has a key to solve the problem, by changing the rule of distribution justice and the role of social actors.

1-1. Research method

Data are acquired from interviews with those involved in, or protest for, the projects. The various ripple effects of wind power projects can be elucidated by actor network analyze method, which enables us to grasp what kind of social actors are involved, or stand against, based on what kind of value judgments. In addition, we will compare the two cases. One is lead by enterprise and faced on protest movement, the other is lead by community wind power and welcomed from various social actors.

Part of this study involves a quantitative understanding of the factors that influenced citizens to invest or going to invest, based on written questionnaire survey.

2. Protest Movement against Wind Power

Although there have been discouraging situation for the wind energy, both political and in the market, the number of wind power are still increasing in Japan. However, increasing number of naturalists are organizing protesting movements against wind power projects. They are cautionary about avian collision problem and / or landscape.

^{*} Corresponding author, University of Tokyo, Faculty of Arts and Sciences, Phone: +81-29-861-7150 Fax: +81-3-5465-8213, e-mail: maruyama@komed.c.u-tokyo.ac.jp, Mailing address: Komaba 3-8-1, Meguro-ku, Tokyo.

[†] Hosei University, Faculty of Humanity and Environment, e-mail: nishikido@hosei.ac.jp

[‡] Aalborg University International Doctoral School of Technology and Science / Institute for Sustainable Energy Policies, furuya_shouta@isep.or.jp

[§] Institute for Sustainable Energy Policies, tetsu@isep.or.jp

After the first accident of sea eagle in 2000, conflict seems to have become more serious. Some of the projects are stopped because of failure of social consensus building.

The communication process has already started. But it does not always have conversation. Wind power developers have started defending, arguing that:

- + According to scientific report (e.g. Erickson, et al. 2001), impacts of wind power stations are relatively low, compared with other factors like building, high-tension line, cars, etc.
- + Wind power has positive effects for nature conservation, for it works for preserving biodiversity, by reducing CO2 emission.

Meanwhile, nature conservation groups insist on

- + The risk cannot be underestimated, without considering possibility of scavenger (Wild Bird Society of Japan, 2004, Wild Bird Society of Japan, 2007).
- + Even if risk is relatively low, it does not always mean that risk is appropriate, for the risk has a nature of being added (Nimuoro Nature Research Group, 2003, Maeda Ippo Foundation/ Hokkaido Environment Foundation, 2004).

The reason why discussion does not meet the point lies in risk communication. Sometimes the counter groups afford no risk of the accident, while developers try to minimize it. One of the nature conservation NGO comments in the contributed article of a quality news paper; "Admitting that wind power contributes for conserving biodiversity in general, it is also sure that the project damages local nature environment." Another group state that

The problem is, if wind energy is really "environment-friendly" when it clearly damages nature environment, and that this kind of energy really contribute to the reduction of CO2, and that wind energy developers seem to plan the project without thinking about benefit of resident and citizen.

(http://www.d1.dion.ne.jp/~akaki_ch/dangamine.html, Translated by Author)

Thus protesting movement seems to be NIMBY (Not in my Backyard) problem. When we see local society, imbalance in distribution of cost and benefit can be found, especially in the short term, even if it brings some economic effect to some of social actor there. For local society, the consequence of CO2 emission reduction is not very easy to comprehend, for the effect of one project in the macro socio-economic framework is relatively small, and it must be tested years. On the other hand, it is easy to point out various risk brought by the project.

Moreover, there is also effect of social network of naturalist behind the protest movement. Table 1 shows the result of a signature-collecting campaign against a wind

farm project. 25.2% of total signature comes from local society and 42.7% comes from citizens living in other area of the same prefecture where the project is planned. Distance from the site has no significant effect on population ratio of signatory.

Table 1 Result of a signature-collecting campaign

Area	local A	local B	local C	neighboring region A	neighboring region B	other region in same	other prefecture	total
Amount of signature	162	1,086	7,049	1,693	1,270	11,109	10,617	32,986
Component ratio	0.5%	3.3%	21.4%	5.1%	3.9%	33.7%	32.2%	100%
Distance from site(km)	5.1	8.3	17.5	18	19	-	-	
Population ratio of sign	7.5%	15.3%	10.9%	6.4%	8.9%	-	-	

3. Spread of Citizen Wind Power in Japan

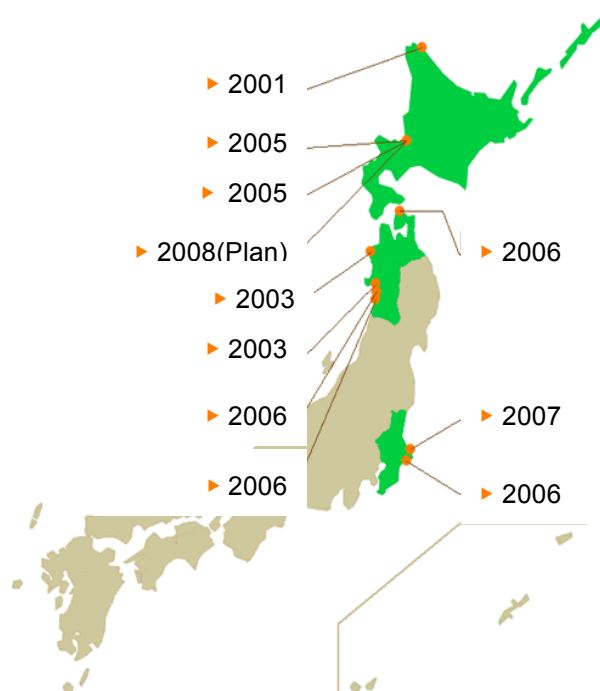
As stated above, we should pay attention to the short term benefit of local society, if we are to improve social acceptance of wind power. For this reason, the other reaction of citizen, community wind power project, is remarkable. This type of project in Japan is called citizen wind power. It was set up in 2001. Now funds were collected 18 million dollar for 10 projects, the majority of which has come from ordinary citizens.

In the projects, investors are not limited in the local regions, for this movement aims at realizing citizen participation in the issue of global warming. For this purpose, investors are provided added values, e.g. certificate card, have their name inscribed on the tower, and events at the site. These are also aimed at stimulating investment as environmental action (Maruyama et al., 2007).

3-1 Spread of citizen wind power in Japan and the 2 stages

As evidenced by continuous enquiries from the general public when citizen wind power financing applications are opened and fulfillment of financing requirements prior to close of applications periods, the level of social interest and demand concerning citizen wind power is certainly rising (Figure 3-1 and Table 3-1).

Figure 3-1. Location status of citizen wind power (as at August 2007)



Source: Hokkaido Green Fund website

Table 3-1. Citizen wind power summary (as at October 2007)(Nishikido, Furuya, 2007)

Location	Operations Commenced	Approximately Capital Outlay (¥)	Investment Amount (¥)	Number of Investors
Hokkaido	2001 September	¥200 million	¥141.5 million	217
Aomori	2003 February	¥380 million	¥178.2 million	776
Akita	2003 March	¥340 million	¥109.4 million	443
Hokkaido	2005 March	¥325 million	¥470 million	596
Hokkaido	2005 March	¥325 million		
Aomori	2006 March	¥245 million	¥860 million	1043
Akita	2006 March	¥325 million		
Akita	2006 March	¥350 million		
Ibaraki	2007 September	¥345 million		
Chiba	2006 July	¥333 million		

The expansion of citizen wind power projects in Japan is able to be divided into two stages from the financing. The first stage, the so called dawning of the projects, was the period where a pattern of finance was sought.

The first project in September 2001 was developed as an extension of a Hokkaido consumer campaign (consumer cooperatives) against nuclear power. Since the 1990's, the anti-nuclear movement in Hokkaido has been shouldered by union members of the Consumer Cooperative (many of whom are house wives). Consequently, investors were highly environmentally aware, personally pro-environmental behaviour and leaders of environmental movements. Whilst a

single investment lot was ¥500,000(about \$5,000), therein also existed groups of 10 people each investing ¥50,000.

On the other hand, operators of the following project in 2003 intended to build support of local residents. With a single investment lot of ¥100,000, investment was made easier. Further, investors were classified by region, with slightly higher target yields for local investors compared to investors from around Japan, so the mechanism of investment was such that ‘benefits of winds blowing in local areas would return home’. Looking at the motivations of local investors, the motivation of environmentalism was relatively weak, whilst motivations of wanting one’s own windmill and seeking commitment for citizen wind power were relatively strong. Further, economic motivations, such as dividend expectation, were relatively strong. The financing is never regarded as donation campaign.

The second stage was the citizen wind power constructed since 2005. The entire country uniformly determined a single investment lot of ¥500,000. As with the citizen wind power in 2003, the significant point was that investors were closely related to the local region and benefits of wind power returned to the region. However, by making the investment lot a small amount, huge administration costs were incurred as application numbers increased. Depending on the favorable treatment to local citizens, there was also the criticism that “despite no difference in the sentiment to support citizen wind power, why favour local areas?” However, a large number of investors assembled for the successive construction of citizen wind power in 2005 and 2006.

3-2 Motivation for investing in citizen wind power

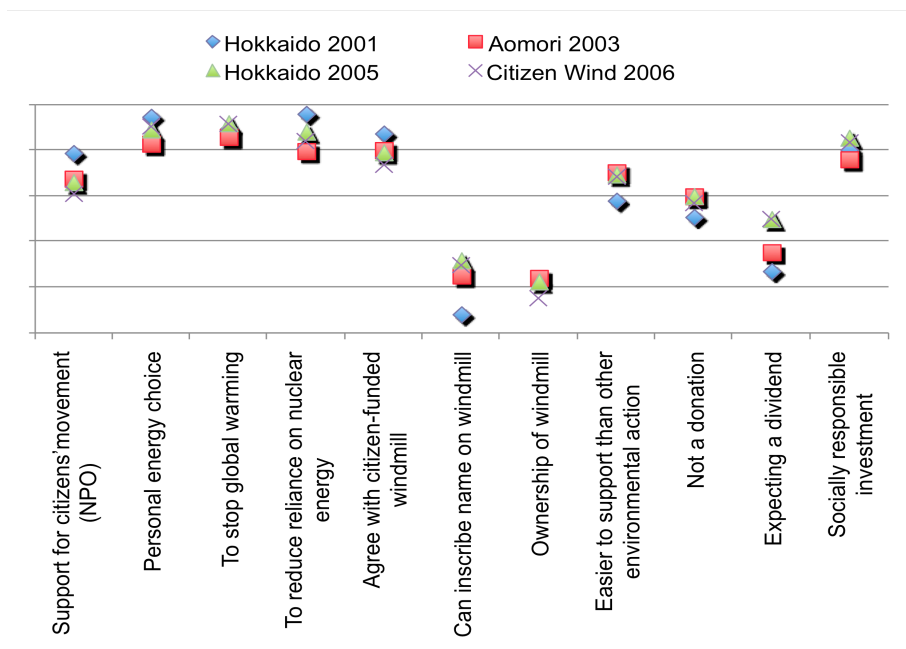
So, what type of people are these investors currently gathered from around the country? Let us take a look at the following investor profiles and motivations.

Questions were asked in 4 stages concerning 11 items of motivation to invest in citizen wind power (the larger the number the more positive the opinion). Table 3-2 and Figure 3-2 show the average number of respective expectations of each of the citizen wind power investor groups.

Table 3-2. Motivation for investment

	Hokkaido 2001	Aomori 2003	Hokkaido 2005	Citizen Wind 2006
Support for citizens’ movement (NPO)	3.47	3.18	3.15	3.02
Personal energy choice	3.86	3.57	3.72	3.76
To stop global warming	3.73	3.64	3.79	3.79
To reduce reliance on nuclear energy	3.89	3.49	3.70	3.59
Agree with citizen-funded windmill	3.68	3.50	3.47	3.34
Can inscribe name on windmill	1.70	2.12	2.29	2.24
Ownership of windmill	2.06	2.10	2.06	1.88
Easier to support than other environmental action	2.94	3.25	3.23	3.20
Not a donation	2.76	2.99	2.99	2.91
Expecting a dividend	2.17	2.38	2.74	2.74
Socially responsible investment	3.50	3.40	3.63	3.58

Figure 3-2. Motivation for investment



As shown above, there are contrasting results for the motivation of investors in the project in 2001 and 2003. With the former group, “environmental movement” aspects were strong motivations with high points such as “support for citizens’ movement (NPO)”, “personal energy choice” and “to reduce reliance on nuclear energy”. Further, there was also a connection to being the Japan’s first ever citizen wind power with one of the motivations also being “empathizing with the intention of building a large windmill with citizen cooperation.” On the other hand, these items were relatively low for investors in the project of 2003. Rather, the high reasons such as “not a donation” and “can inscribe name on windmill” speak of commitment to citizen wind power and the importance of economic factors.

On the other hand, looking at investors of citizen wind power completed since 2005, the three motivations; “environmental movement” such as “personal energy choice” and “to reduce reliance on nuclear energy”; commitment to citizen wind power such as “can inscribe name on windmill” and; economic drivers such as “not a donation” and “expecting a dividend” can be seen to all coexist. In particular, economic motivations have become stronger than before with it is now possible to offer the reason of “wanting to make a socially responsible investment” for investing in citizen wind power.

For people who “interested in environmental issues and want to do something to contribute but are not sure what”, the arrangement of investing in citizen wind power is a visible way of contributing to environmental issues and whilst there is a small risk, since it is not a donation, there is “no loss”. Therefore, it is “easier to contribute than other environmental movements”. Furthermore, inscribing ones name on the windmill

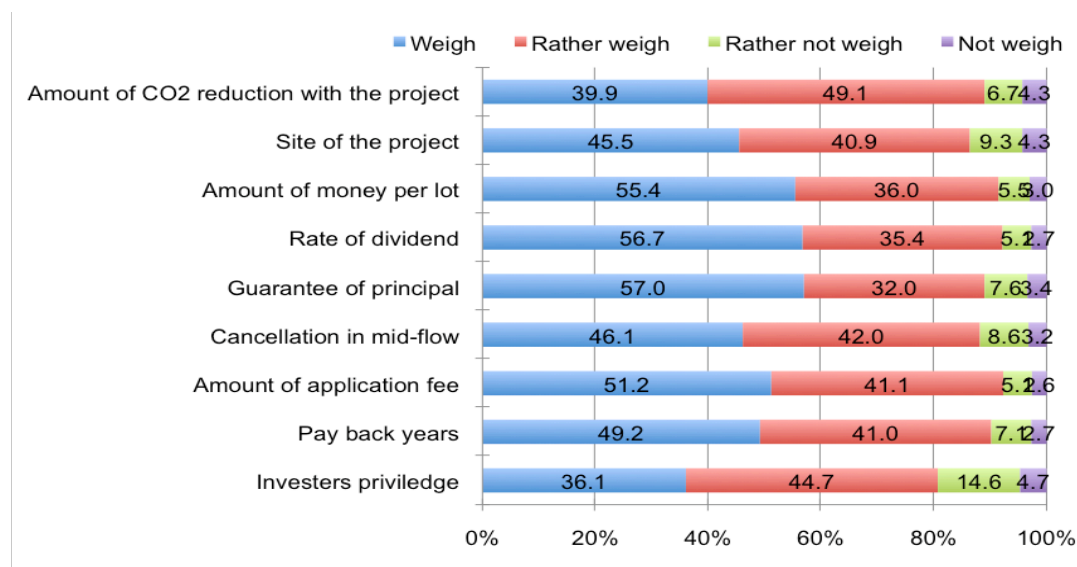
is a means of making citizen wind power familiar. It is likely that such a citizen wind power set-up is the reason why people invest.

4. Development Potential for Citizen wind power

So, what degree of potential exists for future development of citizen wind power? The key to this issue is that to date, many citizen wind power investors have been highly environmentally aware urban residents living a long way from windmill locations. Thus, let us consider the extent to which potential investors exist in urban areas. Specifically, let us at look the interest of citizens in environmental energy projects and what points are taken into account when investing and to what degree. Reference is made to results of the “Survey Research about Fund for Climate Change in Tokyo 2007” (herein, “Tokyo survey”) conducted by the Japan Green Foundation for Renewable Energy**.

Firstly, interest in sustainable energy projects funded by citizens was 66.9%, a generally positive response. Results from the question about importance in evaluating citizen energy projects are shown in Figure 4-1.

Figure 4-1. Level of weigh on the items



It can be seen that amongst items which are all considered important, respondents highlighted the fund components of ‘amount of money per lot’ (55.4%), ‘rate of dividend’ (56.7%) and ‘guarantee of principal’ (57.0%) to have particular importance. So, what are the specific preferences for renewable energy projects amongst these urban dwelling potential investors? In order to clarify this point, the Tokyo survey conducted a conjoint analysis concerning the preferences for various components,

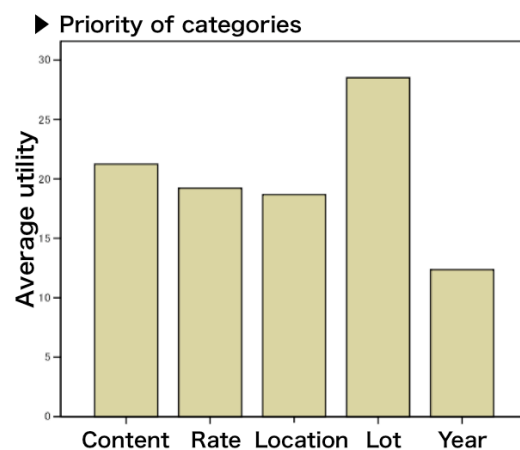
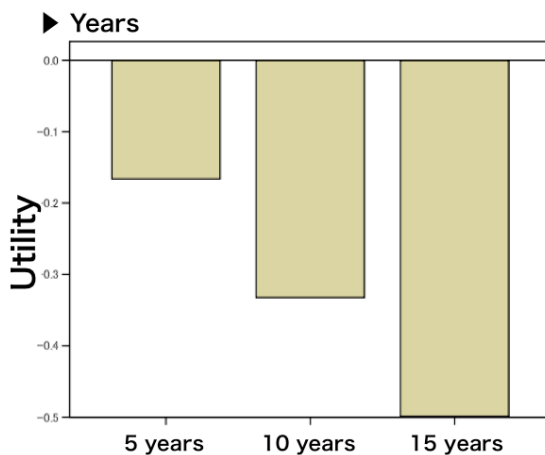
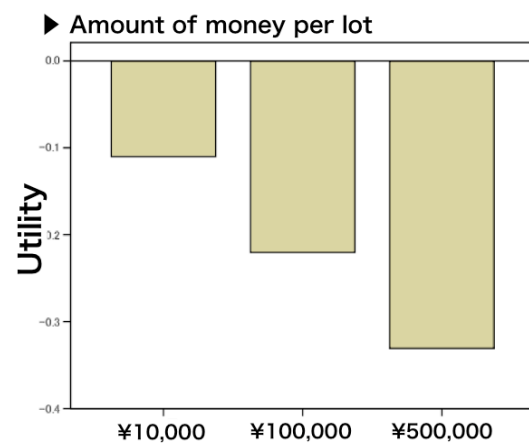
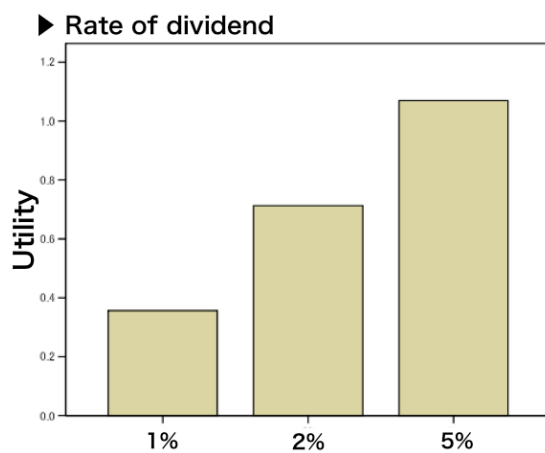
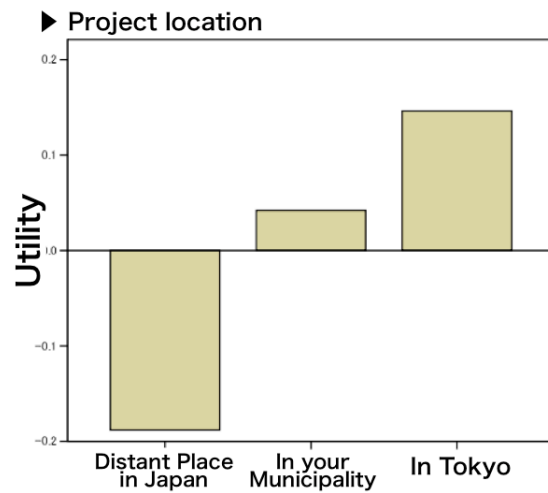
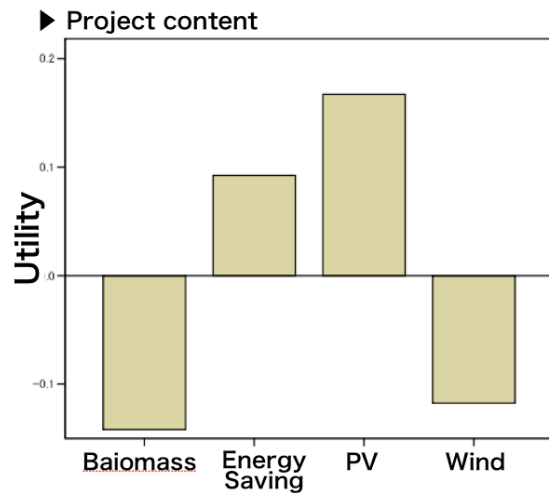
** The survey report is available from http://www.shimin-kikin.jp/library/survey_research_about_fund_for_the_climate_change_in_Tokyo_2007.pdf (Japanese).

which constitute renewable energy projects and funds. Specifically, respondents were asked how they would like to invest in funds comprised at random from 16 values across 5 categories (Table 4-2). The statistically processed results are shown in table 4-3.

Table 4-2. Factors and items of conjoint analysis

Factor	Item
Project content	Wind, PV, biomass, energy saving
Project location	Distant place in Japan, In your municipality, In Tokyo
Rate of dividend	5%, 2%, 1%
Amount of money per lot	¥500,000, ¥100,000, ¥10,000
Years	15 years, 10 years, 5 years

Figure 4-3. Results of conjoint analysis



The table indicates the size of each standard used for the respective categories with “priority of categories” showing the priority between categories. The most preferable content is PV. The order of preference for location is In Tokyo. Distant place in Japan has negative utility. About the terms and condition of the investment, nothing special is found. Preferable items are the higher rate, lower amounts, and shorter time period. The priority of factors was amount of money per lot>project content>dividend rate>project location>number of years with the amount of money per lot being

particularly important.

Considering these results overall, on the project side, the trend is that solar power and energy conserving projects conducted at relatively close locations are favorable. That means “visible” projects will be welcomed.

Results and Conclusions

We discover the rule of distributing cost and benefit is a background of protest movement against wind power. There is a lack of distribution justice or procedure justice behind the miscommunications and discommunications between developers and residents.

Community wind power has a key to solve the conflict, for the project provides various benefits to various social actors, by producing various ripple effects. Questionnaire survey also shows that citizens are not involved only by economic incentive. Three factors, environmental movement, economic benefit, and social commitment, have been found as incentives for investors of community wind power. The diversity and variety of incentives suggests that there is mental and moral value of wind energy, such as consciousness, participation, and compassion. Tokyo survey also shows that there is a high potential interest amongst citizen, especially on condition that the project is “visible.”

The advantage of community wind power is to realize diverse values at the same time, by networking various citizens in a big cities and rural areas as a kind of owners’ community.

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